QUICK REVIEW 3.2 *(For help, go to Section P.5.)*

In Exercises 1 and 2, convert the percent to decimal form or the decimal into a percent.

1. 15%

2. 0.04

3. Show how to increase 23 by 7% using a single multiplication.

4. Show how to decrease 52 by 4% using a single multiplication.

In Exercises 5 and 6, solve the equation algebraically.

5. $40 \cdot b^2 = 160$

6. $243 \cdot b^3 = 9$

In Exercises 7–10, solve the equation numerically.

7. $782b^6 = 838$ **8.** $93b^5 = 521$

9. $672b^4 = 91$ **10.** $127b^7 = 56$

SECTION 3.2 EXERCISES

In Exercises 1–6, tell whether the function is an exponential growth function or exponential decay function, and find the constant percentage rate of growth or decay.

1. $P(t) = 3.5 \cdot 1.09^t$ **2.** $P(t) = 4.3 \cdot 1.018^t$

3. $f(x) = 78{,}963 \cdot 0.968^x$ **4.** $f(x) = 5607 \cdot 0.9968^x$

5. $g(t) = 247 \cdot 2^t$ **6.** $g(t) = 43 \cdot 0.05^t$

In Exercises 7–18, determine the exponential function that satisfies the given conditions.

7. Initial value = 5, increasing at a rate of 17% per year

8. Initial value = 52, increasing at a rate of 2.3% per day

9. Initial value = 16, decreasing at a rate of 50% per month

10. Initial value = 5, decreasing at a rate of 0.59% per week

11. Initial population = 28,900, decreasing at a rate of 2.6% per year

12. Initial population = 502,000, increasing at a rate of 1.7% per year

13. Initial height = 18 cm, growing at a rate of 5.2% per week

14. Initial mass = 15 g, decreasing at a rate of 4.6% per day

15. Initial mass = 0.6 g, doubling every 3 days

16. Initial population = 250, doubling every 7.5 hours

17. Initial mass = 592 g, halving once every 6 years

18. Initial mass = 17 g, halving once every 32 hours

In Exercises 19 and 20, determine a formula for the exponential function whose values are given in Table 3.11.

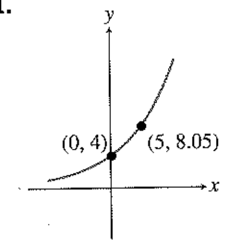
19. $f(x)$ **20.** $g(x)$

Table 3.11 Values for Two Exponential Functions

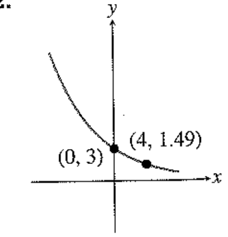
x	$f(x)$	$g(x)$
−2	1.472	−9.0625
−1	1.84	−7.25
0	2.3	−5.8
1	2.875	−4.64
2	3.59375	−3.7123

In Exercises 21 and 22, determine a formula for the exponential function whose graph is shown in the figure.

21.



22.



In Exercises 23–26, find the logistic function that satisfies the given conditions.

23. Initial value = 10, limit to growth = 40, passing through (1, 20).

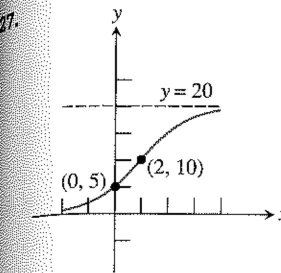
24. Initial value = 12, limit to growth = 60, passing through (1, 24).

25. Initial population = 16, maximum sustainable population = 128, passing through (5, 32).

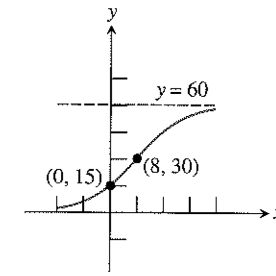
26. Initial height = 5, limit to growth = 30, passing through (3, 15).

In Exercises 27 and 28, determine a formula for the logistic function whose graph is shown in the figure.

27.



28.



29. Exponential Growth The 2000 population of Jacksonville, Florida was 736,000 and was increasing at the rate of 1.49% each year. At that rate, when will the population be 1 million?

30. Exponential Growth The 2000 population of Las Vegas, Nevada was 478,000 and is increasing at the rate of 6.28% each year. At that rate, when will the population be 1 million?

31. Exponential Growth The population of Smallville in the year 1890 was 6250. Assume the population increased at a rate of 2.75% per year.

(a) Estimate the population in 1915 and 1940.

(b) Predict when the population reached 50,000.

32. Exponential Growth The population of River City in the year 1910 was 4200. Assume the population increased at a rate of 2.25% per year.

(a) Estimate the population in 1930 and 1945.

(b) Predict when the population reached 20,000.

33. Radioactive Decay The half-life of a certain radioactive substance is 14 days. There are 6.6 g present initially.

(a) Express the amount of substance remaining as a function of time t.

(b) When will there be less than 1 g remaining?

34. Radioactive Decay The half-life of a certain radioactive substance is 65 days. There are 3.5 g present initially.

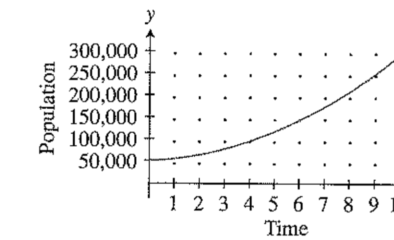
(a) Express the amount of substance remaining as a function of time t.

(b) When will there be less than 1 g remaining?

35. Writing to Learn Without using formulas or graphs, compare and contrast exponential functions and linear functions.

36. Writing to Learn Without using formulas or graphs, compare and contrast exponential functions and logistic functions.

37. Writing to Learn Using the population model that is graphed, explain why the time it takes the population to double (doubling time) is independent of the population size.



38. Writing to Learn Explain why the half-life of a radioactive substance is independent of the initial amount of the substance that is present.

39. Bacteria Growth The number B of bacteria in a petri dish culture after t hours is given by

$$B = 100e^{0.693t}.$$

When will the number of bacteria be 200? Estimate the doubling time of the bacteria.

40. Radiocarbon Dating The amount C in grams of carbon-14 present in a certain substance after t years is given by

$$C = 20e^{-0.0001216t}.$$

Estimate the half-life of carbon-14.

41. Atmospheric Pressure Determine the atmospheric pressure outside an aircraft flying at 52,800 ft (10 mi above sea level).

42. Atmospheric Pressure Find the altitude above sea level at which the atmospheric pressure is 2.5 lb/in.^{2}.

43. Population Modeling Use the 1950–2000 data in Table 3.12 and exponential regression to predict Los Angeles's population for 2003. Compare the result with the listed value for 2003.

44. Population Modeling Use the 1950–2000 data in Table 3.12 and exponential regression to predict Phoenix's population for 2003. Compare the result with the listed value for 2003. Repeat these steps using 1960–2000 data to create the model.

Table 3.12 Populations of Two U.S. Cities (in thousands)

Year	Los Angeles	Phoenix
1950	1970	107
1960	2479	439
1970	2812	584
1980	2969	790
1990	3485	983
2000	3695	1321
2003	3820	1388

Source: World Almanac and Book of Facts, 2002, 2005.